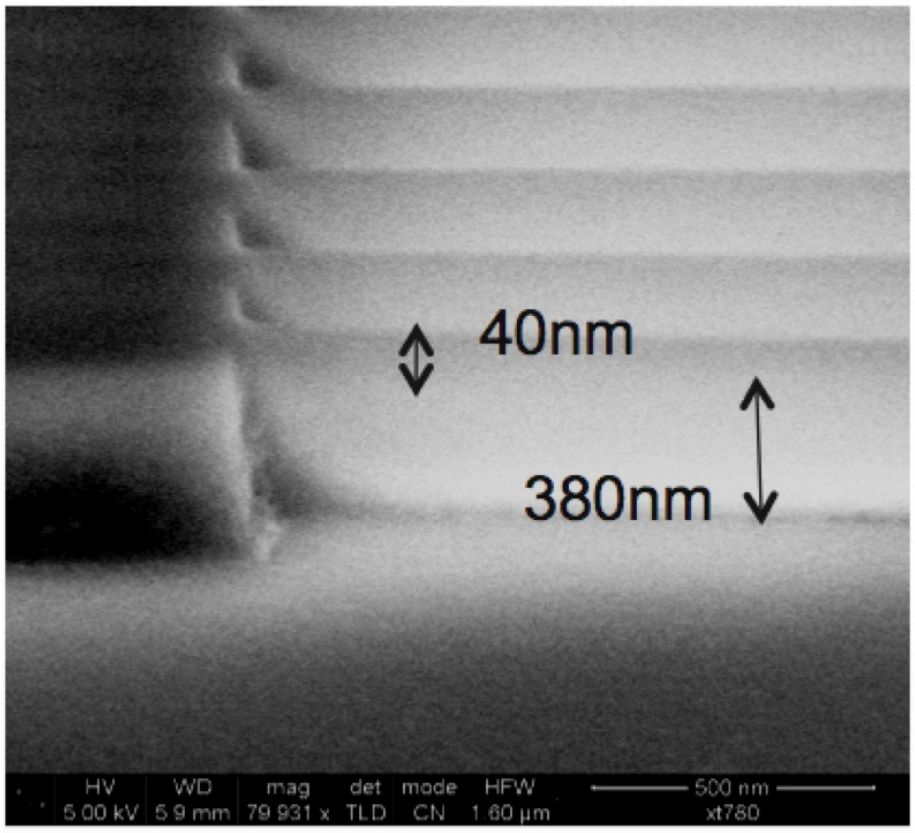
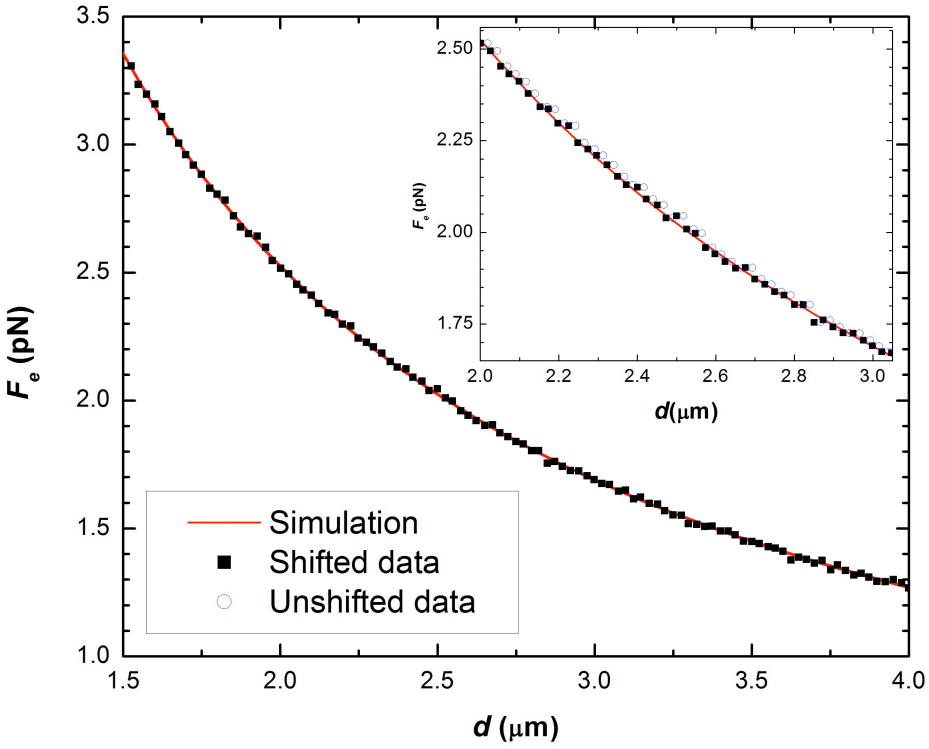
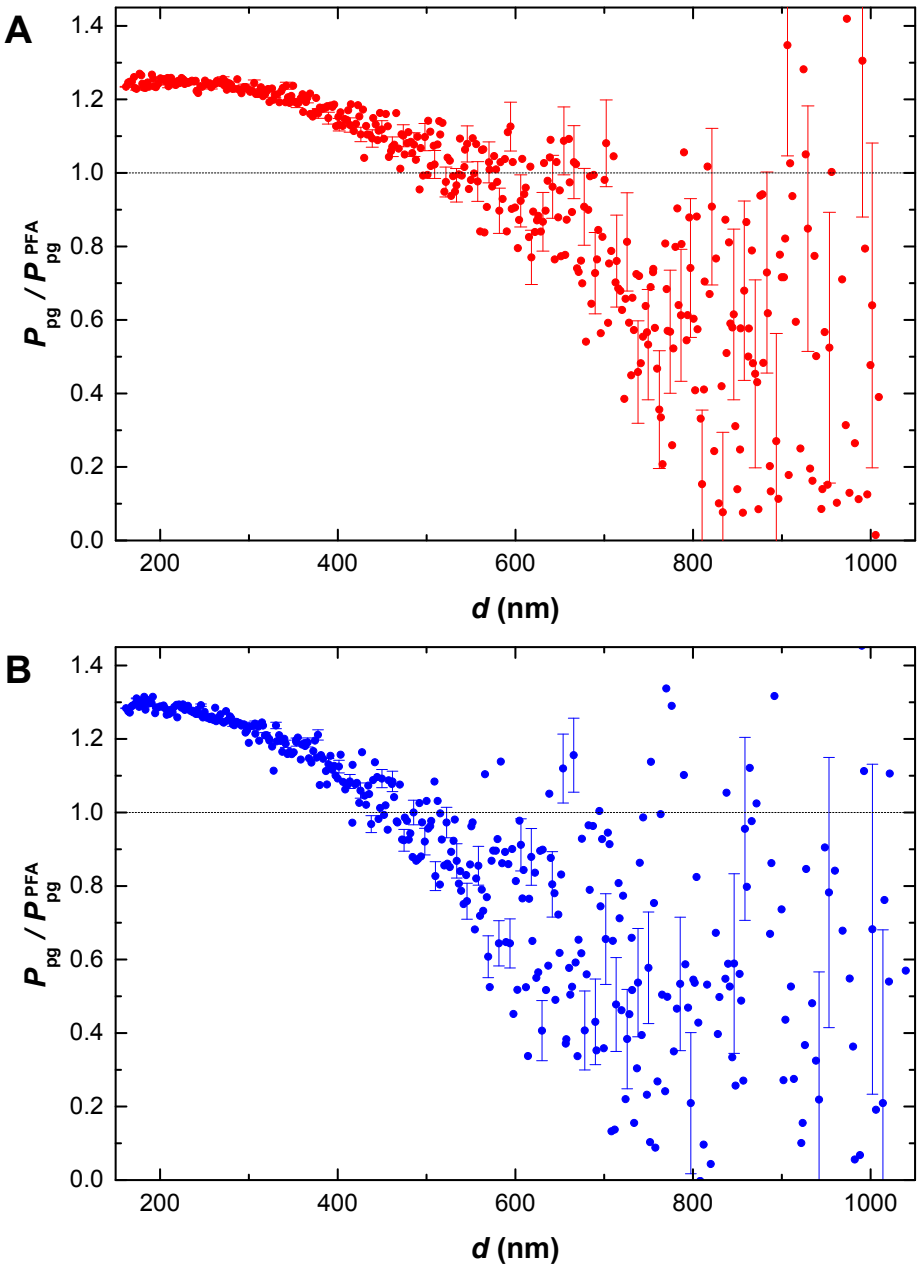


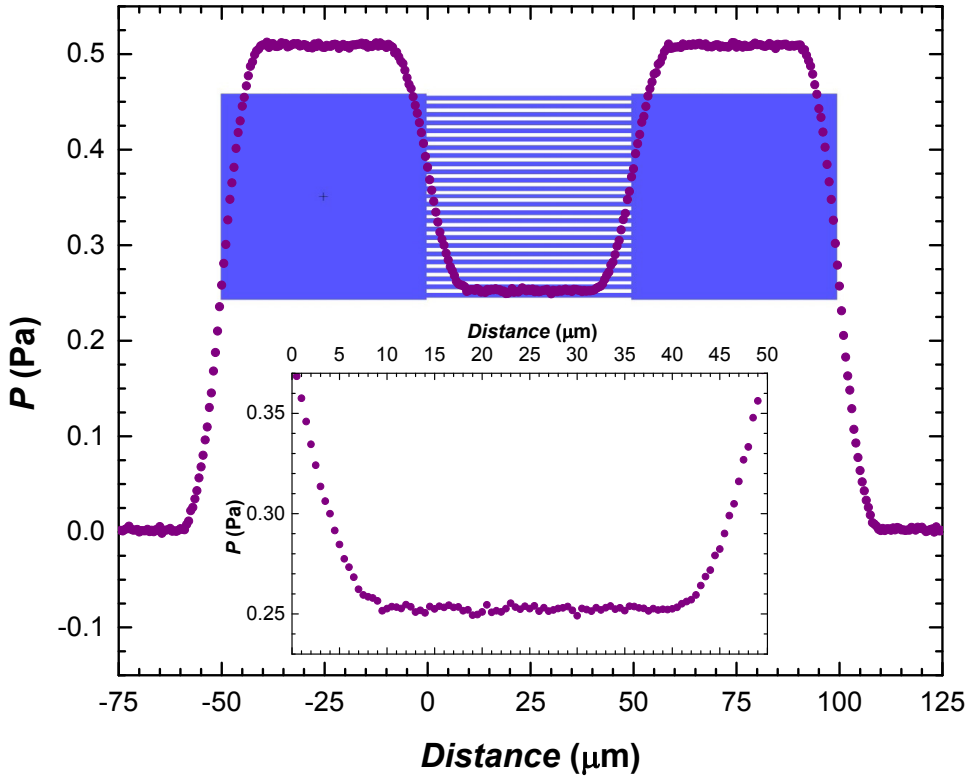
Supplementary Figure S1. SEM image of a typical HSQ mold before deposition of Au.



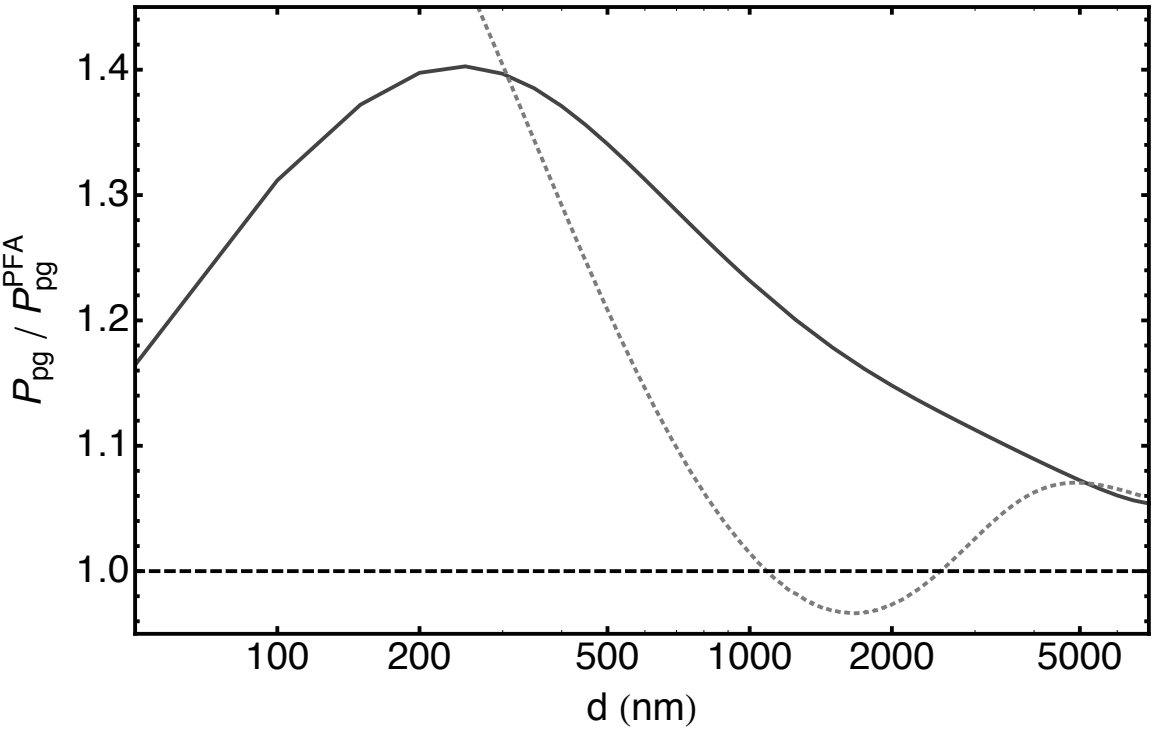
Supplementary Figure S2. Plane-grating electrostatic force obtained using a commercial finite element electrostatic solver (solid lines) and the shifted measured data (black squares). The inset shows, in addition to these two sets, the data before shifting (open circles).



Supplementary Figure S3. Equivalent plane-grating Casimir pressure normalized by the PFA expression shown in Eq. (1), as a function of separation between the sphere and the electroplated gratings. The upper panel shows the results obtained using sample 2 and the lower panel the ones from sample 1. Since the calculation of the P^{PFA} is assumed to be exact, error bars are the variance of the mean measured pressure over the 45 repetitions of the experiment for each sample. They are plotted every fifth data point to increase the clarity of the figure.



Supplementary Figure S4. Equivalent pressure as a function of position when the sphere is scanned on top of the pad-grating system. Data was acquired at a sphere-grating separation of 200 nm. The sample used was Sample 3 (300/130/480). For clarity, the schematic of the pad-grating assembly is shown. Inset: Zoom in on the grating region, showing the flatness of the data on the center region.



Supplementary Figure S5. Plot of the equivalent plane-grating pressure for sample 1 normalized by the corresponding PFA prediction in Eq.(1). The solid line is the full numerical result for the modal approach as in Eq. (2), and the dotted line represents the result of the calculation performed within an effective medium approach (see text). These results show that effective medium cannot be trusted below 5 μm.